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# Ethnic Differences in Diabetes Management in Patients With and Without Comorbid Medical Conditions

A cross-sectional study

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**OBJECTIVE**—To examine ethnic disparities in diabetes management among patients with and without comorbid medical conditions after a period of sustained investment in quality improvement in the U.K.

**RESEARCH DESIGN AND METHODS**—This cross-sectional study examined associations between ethnicity, comorbidity, and intermediate outcomes for mean A1C, total cholesterol, and blood pressure levels in 6,690 diabetes patients in South West London.

**RESULTS**—The presence of  $\geq 2$  cardiovascular comorbidities was associated with similar blood pressure control among white and South Asian patients when compared with whites without comorbidity but with worse blood pressure control among black patients, with a mean difference in systolic blood pressure of +1.5, +1.4, and +6.2 mmHg, respectively.

**CONCLUSIONS**—Despite major reforms to improve quality, disparities in blood pressure management have persisted in the U.K., particularly among patients with cardiovascular comorbidities. Policy makers should consider the potential impacts of quality initiatives on high-risk groups.

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An increasing number of people with diabetes have comorbid medical conditions (1). These patients can be complex to manage, have a higher risk of additional morbidity and mortality, and represent a growing cost for health systems (1,2).

People from ethnic minorities are more likely to have comorbid medical conditions than whites, and delivering high-quality diabetes management to this high-risk group is particularly important for reducing disparities in health outcomes (3–5). Previous studies suggest that patients with multiple conditions may receive similar or higher quality of care

than those with a single condition and may have benefited more from quality improvement strategies (6–9). However, few studies have examined whether these benefits extend to patients with diabetes from minority ethnic groups.

The aim of this study was to examine ethnic disparities in diabetes management among people with and without comorbidity in the U.K.'s National Health Service after a period of sustained investment in quality improvement.

## RESEARCH DESIGN AND METHODS

**METHODS**—The study was conducted in 29 family practices in Wandsworth,

London. We identified all adults ( $\geq 18$  years) with a diagnosis of diabetes registered in 2007 from their electronic medical record (EMR) using an established method (10). Women with gestational diabetes were excluded. We identified comorbid medical conditions from the EMR and divided these into conditions with concordant (hypertension, heart failure, stroke, atrial fibrillation, coronary heart disease, chronic kidney disease) and discordant management goals (chronic obstructive pulmonary disease, asthma, depression) and calculated the number of comorbidities for each patient. Patients who had conditions with both concordant and discordant management goals were categorized as having a concordant condition. Information on ethnic background was collected from patients during registration or consultations. We assigned a socioeconomic status score to each patient based on his or her practice postcode using the Index of Multiple Deprivation (11).

Our outcome measures were the patients' last recorded A1C, systolic and diastolic blood pressure, and total cholesterol values in 2007. To examine associations between ethnicity, number of comorbidities, and outcome measures, regression models were fitted with practice as a random effect to allow for clustering of patients in practices. Models were adjusted for age, sex, duration of illness, BMI, and socioeconomic status score. We included an interaction term in each model to examine whether the association between comorbidity and our outcome measures varied between ethnic groups. Statistical analyses were performed using Stata 10.1 software (StataCorp LP, College Station, TX).

**RESULTS**—We identified 7,542 patients with diabetes in 29 family practices. We excluded 113 patients (1.5%) with implausible or missing values and 739 (9.8%) without a recorded ethnicity, leaving 6,690 patients (50.9% men and 49.1% women). Of these, 42.8% were

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white, 24.4% were black, and 22.2% were South Asian. Table 1 reports the mean differences in intermediate outcomes by ethnicity and number of comorbidities. An interaction between ethnicity and comorbidity was found for systolic blood pressure ( $P = 0.03$ ). Because no interactions were found for diastolic blood pressure, A1C, and cholesterol, we only present the main effects.

### Systolic blood pressure

Compared with white patients without comorbidities, mean systolic blood pressure was higher in white patients with one concordant comorbidity (4.6 mmHg,  $P < 0.001$ ) but was similar to those with two more concordant and one or more discordant comorbidities (Table 1). Relative to white patients without comorbidities, mean systolic blood pressure was similar among black patients without comorbidities and with one or more discordant condition but was higher among black patients with one (5.9 mmHg,  $P < 0.001$ ) and two or more concordant comorbid conditions (6.2 mmHg,  $P < 0.001$ ). Relative to white patients without

comorbidity, the mean systolic blood pressure was lower among South Asian patients without comorbidity ( $-2.3$  mmHg,  $P < 0.05$ ) and with one or more discordant condition but was similar in South Asian patients with concordant comorbid conditions.

### Diastolic blood pressure

Mean diastolic blood pressure was higher among black patients (1.3 mmHg,  $P < 0.001$ ) compared with white or South Asian patients. It was higher among people with one concordant condition and lower in patients with one or more discordant conditions compared with those without comorbidity.

### A1C

Compared with white patients, mean A1C was higher among black (0.3%,  $P < 0.001$ ) and South Asian patients (0.2%,  $P < 0.001$ ). Patients with concordant comorbid conditions had lower A1C ( $-0.2\%$ ,  $P < 0.01$ ), and those with discordant conditions had similar mean A1C compared with those without comorbidity.

### Cholesterol

South Asian patients had lower mean cholesterol levels ( $-0.2$  mmol/L,  $P < 0.001$ ) than white or black patients. Patients with concordant comorbid conditions had lower cholesterol levels ( $-0.3$  mmol/L,  $P < 0.001$ ), and patients with discordant conditions had similar mean cholesterol levels compared with those without comorbidity.

**CONCLUSIONS**—The U.K. health system provides universal coverage and has implemented major reforms to improve quality in chronic disease management in primary care. However, ethnic disparities in blood pressure management have persisted, particularly among patients with cardiovascular comorbidities. Consistent with previous U.K. research, we found that patients with concordant comorbidity had lower mean A1C and cholesterol levels but higher mean blood pressure levels compared with patients with no comorbidities (9). This finding may be partly explained by the much poorer blood pressure control among black patients with concordant comorbidity.

Table 1—Mean difference in intermediate outcomes by ethnicity and number of comorbid conditions

Measure	Blood pressure (mmHg)		A1C (%)‡	Cholesterol (mmol/L)‡
	Systolic*	Diastolic†		
Ethnic group comorbidity				
White				
0 (reference)	0	—	—	—
1 concordant	4.6 (3.0–6.1)‡	—	—	—
≥2 concordant	1.5 (–0.3 to 3.3)	—	—	—
≥1 discordant	–1.4 (–3.5 to 0.8)	—	—	—
Black				
0	0.9 (–0.9 to 2.9)	—	—	—
1 concordant	5.9 (4.3–7.6)‡	—	—	—
≥2 concordant	6.2 (3.8–8.5)‡	—	—	—
≥1 discordant	–3.1 (–6.7 to 0.3)	—	—	—
South Asian				
0	–2.3 (–4.2 to –0.3)§	—	—	—
1 concordant	2.6 (–0.5 to 5.3)	—	—	—
≥2 concordant	1.4 (–0.8 to 3.6)	—	—	—
≥1 discordant	–4.2 (–7.5 to –0.9)§	—	—	—
Ethnic group				
White (reference)	—	0	0	0
Black	—	1.3 (0.7–1.9)‡	0.3 (0.1–0.4)‡	–0.04 (–0.1 to 0.02)
South Asian	—	–0.5 (–1.2 to 0.2)	0.2 (0.04 to 0.3)‡	–0.2 (–0.2 to –0.1)‡
Comorbidities, number				
0 (reference)	—	0	0	0
1 concordant	—	1.5 (0.9–2.1)‡	–0.2 (–0.3 to –0.1)‡	–0.1 (–0.2 to –0.1)‡
≥2 concordant	—	–0.1 (–0.9 to 0.6)	–0.2 (–0.4 to –0.1)	–0.3 (–0.4 to –0.2)‡
≥1 discordant	—	–1.0 (–2.0 to –0.6)§	–0.1 (–0.3 to 0.1)	–0.0 (–0.1 to 0.0)

Values are adjusted for age, sex, diabetes duration, BMI, socioeconomic status, and practice level clustering. Mean values are presented with the 95% CI in parenthesis.

\*Interaction between ethnicity and comorbidity ( $P = 0.03$ ). †Interaction between ethnicity and comorbidity ( $P > 0.05$ ). ‡ $P < 0.001$ ; § $P < 0.05$ ; || $P < 0.01$ .

People with diabetes with discordant conditions were not better managed than those without comorbidity. This finding suggests that more frequent contact with health services by itself does not improve the management of diabetes.

Our study has a number of limitations. The cross-sectional design of the study did not allow us to assess the effect of quality improvement initiatives on time trends in disparities in diabetes care. We adjusted our analyses for important key covariates but were unable to adjust for clinic attendance. We could not distinguish between type 1 and 2 diabetes and did not have a patient-level measure of socioeconomic status.

The variations in diabetes management among high-risk patients identified in this study are concerning. This suggests that universal coverage and universal investment in quality initiatives may not be sufficient to address health disparities and that more targeted interventions are required (12,13). Health care planners should consider the needs of ethnic minorities and patients suffering from complex conditions when designing and implementing quality improvement programs and continuously monitor such initiatives.

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R.A. planned the study, analyzed and interpreted data, and wrote the first draft of the manuscript. A.M. interpreted the findings and reviewed the manuscript for important intellectual content. E.P.V. analyzed data, interpreted the findings, and reviewed and edited the manuscript. K.K., V.C., and S.R. interpreted the findings and reviewed the manuscript for important intellectual content. C.M. planned the study, interpreted the findings, and reviewed and edited the manuscript.

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